SECTION 02821

CHAIN LINK FENCE and GATES

PART 1 GENERAL

1.01 RELATED WORK

A. Concrete: Section 03300 Cast in Place Concrete

1.02 REFERENCES

A. Comply with ASTM A 53 for requirements of Schedule 40 piping.

B. Materials and Finishes Standard: ANSI/BHMA A156.18-1993, "American National Standard for Materials and Finishes".

C. UL 325 Gate Operator Requirements.

D. ASTM F 1184 Standard Specification for Industrial and Commercial Horizontal Slide Gates, Type II, Class 2.

E. American Welding Society AWS D1.2 Structural Welding Code.

F. ASTM F 1043 Standard Specification for Strength and Protective Coatings on Steel Industrial Chain Like Fence Framework.

G. ASTM 123 Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel.

1.03 DEFINITIONS

A. Height of Fence: Distance measured from finished grade to the top of fabric.

1.04 SUBMITTALS

A. Shop Drawings: Complete detailed drawings for each height and style of fence and gate required. Include separate schedule for each listing all materials required and technical data such as size, weight, and finish, to ensure conformance to specifications.

B. Product Data: Manufacturer's catalog cuts, specifications, and installation instructions for each item specified.

C. Samples:
   1. Fence Fabric: Minimum one square foot.
   2. Fence and Gate Posts: Two each, one foot long, if requested.
   3. Miscellaneous Materials and Accessories: One each, if requested.

1.05 QUALITY ASSURANCE

A. Comply with standards of the Chain Link Fence Manufacturer's Institute.

B. Provide steel fence and related gates as a complete compatible system including necessary erection accessories, fittings, and fastenings.

C. Posts and rails shall be continuous without splices.

PART 2 PRODUCTS

2.01 MATERIALS

A. Class B Steel Tubing:
   1. SS-40 Fence Pipe by Allied Tube & Conduit Corp., 16100 S. Lathrop Ave., Harvey, IL, 60426, (800) 882-5543.
   2. Tuf-40 Fence Framework by American Tube and Pipe Co., Inc., 2525 N. 27th Ave., Phoenix, AZ 85009, (800) 669-8823.

2.02 STEEL FRAMEWORK (FOR FENCES 6'-1" - 10'-0" HIGH)

A. End Posts, Corner Posts and Pull Posts:
   1. Pipe: 2.875 inches OD, 5.79 pounds per linear foot (Schedule 40).
   2. Square Tubing: 2.50 inches OD, 5.70 pounds per linear foot.
   3. Class B Steel Tubing: 2.875 inches OD, 4.64 pounds per linear foot.
   4. Roll Formed C-Section: ASTM A 570 Grade 45, 3.5 inches by 3.5 inches by 0.128 inch thick, with minimum bending strength of 486 pounds under a 6 foot cantilever load.

B. Line Posts:
   1. Pipe: 2.375 inches OD, 3.65 pounds per linear foot (Schedule 40).
   2. Class B Steel Tubing: 2.375 inches OD, 3.11 pounds per linear foot.
   3. H-section: 2.25 inches by 1.95 inches by 0.143 inches, 4.10 pounds per linear foot.
   4. Roll Formed C-Section: ASTM A 570 Grade 45, 2.25 inches by 1.70 inches by 0.121 inch thick, with minimum bending strength of 316 pounds under a 6 foot cantilever load.

2.03 STEEL FABRIC

A. One-piece widths for fence heights up to 12'-0".

B. Chain link, 2 inch mesh, No. 9 gauge; No. 11 gauge.
   C. Selvages: Top edge and bottom edge twisted and barbed.

2.04 SWING GATE POSTS

A. Single width of gate up to 6'-0" wide and less than 10'-0" high:
   1. Pipe: 2.875 inches OD, 5.79 pounds per linear foot (Schedule 40).
   2. Square Tubing: 2.50 inches OD, 5.70 pounds per linear foot.
   3. Class B Steel Tubing: 2.875 inches OD, 4.64 pounds per linear foot.
   4. Roll Formed C-Section: ASTM A 570 Grade 45, 3.5 inches 3.5 inches by 0.128 inch thick, with minimum bending strength of 486 pounds under a 6 foot cantilever load.

B. Single width of gate over 18'-0" wide:
   1. Pipe: 8.625 inches OD, 24.70 pounds per linear foot (Schedule 30).

2.05 SWING GATE FRAMES

A. Height: 6'-0" - 12'-0", or leaf width exceeding 8'-0":
   1. Pipe: 1.90 inches OD, 2.72 pounds per linear foot (Schedule 40).
   2. Square Tubing: 2 inches OD, 2.60 pounds per linear foot.
   3. Class B Steel Tubing: 1.90 inches OD, 2.28 pounds per linear foot.

B. Assemble gate frames by welding or with special steel fittings and rivets for rigid connections. Install mid-height horizontal rails on gates over 10 feet high. When width of gate leaf exceeds 10 feet, install mid-distance vertical bracing of the same size and weight as frame members. When either horizontal or vertical bracing is not required, provide truss rods as cross bracing to prevent sag or twist.

2.06 SWING GATE HARDWARE

A. Hinges: Non-lift-off type, offset to permit 180 degree swing, and of suitable size and weight to support gate. Provide 1-1/2 pair of hinges for each leaf over 6 feet high.

B. Latch: Forked type for single gates 10 feet wide or less. Drop bar type with keeper for double gates and single gates over 10 feet wide complete with flush plate set in concrete. Drop bar length shall be 2/3 the height of the gate. Padlock eye shall be an integral part of latch construction.

2.07 SLIDING GATE FRAMEWORK

A. Posts
   1. Pipe: 4 inches OD, 9.11 pounds per linear foot (Schedule 40).
   2. Class B Steel Tubing: 4 inches OD, 6.56 pounds per linear foot.

2.08 SLIDING GATE HARDWARE

A. Cantilever type with enclosed tracks and integral latch assembly:
   1. Manual Sliding Gate Hardware System, by Tymetal Corporation, Inc., Anchor Fence, or approved equal.
   2. Electrical Sliding Gate Hardware System by Tymetal Corporation, Inc., Anchor Fence, or approved equal. The slide gate and operator shall be

specifically designed to complement each other as a system and be provided by a single manufacturer. Components (operator from one source and gate panel from another) assembled at the job site to form a system will not be approved.

a. The gate operator shall be UL325 Listed for Class III unsupervised operation.

b. The gate operator shall be equipped with soft-start and soft-stop function to prevent shock load to the gate panel and gate operator.

c. The gate operator shall be equipped with a dual function audio alarm.

d. The gate shall be equipped with an obstruction sensing system. The inherent motor current sensors are part of the gate operator system and may not be removed or bypassed. The installing contractor shall be responsible to ensure that appropriate external secondary entrapment protection devices be installed for the specific site conditions to protect against all potential entrapment zones. Proper operation of these safety devices shall be verified and training as to the operation and maintenance of these devices for the users and owners shall be documented

e. The gate shall be equipped with a digital keyless entry system, with two (2) key pads provided. The keyless system shall be a Linear AccessKey as manufactured by Linear Corporation, or approved equal. Keypads shall be installed and programmed in accordance with the manufacture's directions.

2.09 MISCELLANEOUS MATERIALS AND ACCESSORIES

A. Rails and Post Braces:
   1. Pipe: 1.660 inches OD, 2.27 pounds per linear foot (Schedule 40).
   2. Class B Steel Tubing: 1.660 inches OD, 1.84 pounds per linear foot.
   3. Roll formed C-Section: 1.625 inches by 1.25 inches by 0.0747 inch thick with minimum bending strength of 192 pounds on a 10 foot span.

B. Fittings and Post Tops: Steel, wrought iron, or malleable iron.
   1. Fasteners: Tamper-resistant cadmium plated steel screws.

C. Stretcher Bars: One piece equal to full height of fabric, minimum cross-section 3/16 inch by 3/4 inch.

D. Metal Bands (for securing stretcher bars): Steel, wrought iron, or malleable iron.

E. Wire Ties: Conform to American Steel Wire gauges.
   1. For tying fabric to line posts, rails and braces: 9 gauge (.1483 inch) steel wire.
   2. For tying tension wire to fabric: 11 gauge (.1205 inch) steel hog rings.

F. Truss Rods: 3/8 inch diameter.

G. Concrete: Portland Cement concrete having a minimum compressive strength of 2500 psi at 28 days.

H. Spiral Paper Tubes:
1. Sonotube by Sonoco Products Co., North Second St., Hartsville, SC 29550, (800) 377-2692.
2. Sleek/tubes by Jefferson Smurfit Corp., P.O. Box 66820, St. Louis, Mo 63166, (314) 746-1100.

I. Cold Galvanizing Compound: Single component compound giving 93 percent pure zinc in the dried film, and meeting the requirements of DOD-P-21035A (NAVY).

J. Tension Wire: 7 gauge coiled spring steel wire.

K. Wedge Anchors: 1/2 inch stainless steel, Style TS-12-234SS by Unifast Industries Inc., 45 Gilpin Ave., Hauppauge, NY 11788, (516) 348-0290.

L. Shrink-Resistant Grout (Ferrous): Factory-packaged, non-catalyzed, ferrous aggregate mortar grouting compound selected from the following:
1. Embeco 636 by Master Builders, 23700 Chagrin Blvd., Cleveland, OH 44122, (800) 227-3350.
2. Ferrolith G-NC by Sonneborn, Chemrex, Inc., 57-46 Flushing Ave., Maspeth, NY 11378, (800) 433-9517.
3. Ferro-Grout by L&M Construction Chemicals, 14851 Calhoun Rd., Omaha, NB 68152, (800) 362-3331.
4. Vibra-Foil by A.C. Horn, Inc., Tamm Industries, 7405 Production Dr., Mentor, OH 44060, (800) 862-2667.

2.10 BARBED WIRE

A. Two strand 12-1/2 gauge steel wire, with 14 gauge 4-point steel barbs spaced 5 inches oc.

B. Extension Arms: Pressed steel, wrought iron, or malleable iron, complete with provision for anchorage to posts (including light posts) and attaching 3 rows of barbed wire to each arm.
1. Type: Single 45 degree arm; one for each post.

2.11 FINISHES

A. Steel Framework:
1. Pipe: Galvanized in accordance with ASTM A 53, 1.8 ounces zinc per square foot.
2. Square Tubing: Galvanized in accordance with ASTM A 123, 2.0 ounces zinc per square foot.
3. Class B Steel Tubing: Exterior; 1.0 ounces zinc per square foot plus chromate conversion coating and clear polyurethane. Interior; zinc rich organic coating.

4. H-Section: Galvanized in accordance with ASTM A 123, 2.0 ounces zinc per square foot.
5. Roll Formed C-Section: Galvanized in accordance with ASTM A 123, 2.0 ounces zinc per square foot.

B. Fabric; one of the following:
1. Galvanized Finish: ASTM A 392 class II zinc coated after weaving, with 2.0 ounces per square foot.
2. Aluminized Finish: ASTM A 491 aluminum coated with 0.40 ounces per square foot.

C. Fence and Gate Hardware, Miscellaneous Materials, Accessories:
1. Wire Ties: Galvanized Finish, ASTM A 90 1.6 ounces zinc per square foot, or aluminized finish, ASTM A 809 0.40 ounces per square foot.
2. Hardware and Miscellaneous Items: Galvanized Finish, ASTM A 153 (Table 1).
3. Extension Arms: Hot-dip galvanized after fabrication, ASTM 123, 2.0 ounces zinc per square foot.
4. Angle Beams, I Beams, and Steel Shapes: Galvanized in accordance with ASTM A 123, 2.0 ounces zinc per square foot.

D. Barbed Wire and Tension Wire; one of the following:
1. Galvanized Finish: ASTM A 121 class 3, 0.80 ounces per square foot.
2. Aluminized Finish: ASTM A 585 class 2, 0.30 ounces per square foot.

PART 3 EXECUTION

3.01 PREPARATION

A. Clear and grub along fence line as required to eliminate growth interfering with alignment. Remove debris from State property.

B. Do not begin installation of fence in areas to be cut until finished grading has been completed.

3.02 INSTALLATION

A. Space posts equidistant in the fence line with a maximum of 10 feet on center. For fences 16 feet and higher space posts a maximum of 8 feet on center.

B. Setting Posts in Earth: Drill holes for post footings. If existing grade at the time of installation is below finished grade, provide spiral paper tubes to contain concrete to finish grade elevation. Set posts in center of hole and fill hole with concrete. Plumb and align posts. Vibrate or tamp concrete for consolidation. Finish concrete in a dome shape above finish grade elevation to shed water. Do not attach fabric to posts until concrete has cured a minimum of 7 days.

C. Locate corner posts at corners and at changes in direction. Use pull posts at all abrupt changes in grade and at intervals no greater than 500 feet. On runs over

500 feet, space pull posts evenly between corner or end posts. On long curves, space pull posts so that the strain of the fence will not bend the line posts.

D. Install top rail continuously through post tops or extension arms, bending to radius for curved runs. Install expansion couplings as recommended by fencing manufacturers.

F. Install top rails in one piece between posts and flush with post on fabric side using special offset fittings where necessary.

G. Diagonally brace corner posts, pull posts, end posts, and gate posts to adjacent line posts with truss rods and turnbuckles.

H. Attach fabric to security side of fence. Maintain a 2 inch clearance above finished grade except when indicated otherwise. Thread stretcher bars through fabric using one bar for each gate and end post and 2 for each corner and pull post. Pull fabric tight so that the maximum deflection of fabric is 2 inches when a 30 pound pull is exerted perpendicular to the center of a panel. Maintain tension by securing stretcher bars to posts with metal bands spaced 15 inches oc. Fasten fabric to steel framework with wire ties spaced 12 inches oc for line posts and 24 inches oc for rails and braces. Bend back wire ends to prevent injury. Tighten stretcher bar bands, wire ties, and other fasteners securely.

I. Position bolts for securing metal bands and hardware so nuts are located opposite the fabric side of fence. Tighten nuts and cut off excess threads so no more than 1/8 inch is exposed. Peen ends to prevent loosening or removal of nuts.
1. Secure post tops and extension arms with tamper-resistant screws.

J. Install gates plumb and level and adjust for full opening without interference. Install ground-set items in concrete for anchorage, as recommended by fence manufacturer. Adjust hardware for smooth operation and lubricate where necessary.

K. Tension Wire: Support bottom edge of fabric with tension wire. Weave tension wire through fabric or fasten with hog rings spaced 24 inches oc. Tie tension wire to posts with 9 gauge wire ties.

Q. Wire brush and repair welded and abraded areas of galvanized surfaces with one coat of cold galvanizing compound.

R. Restore disturbed ground areas to original condition. Topsoil and seed to match adjacent areas.

3.03 ADJUSTING

A. Adjust operative units and equipment to work freely and easily, ready for use. Field lubricate operating and locking systems in accordance with the manufacturer's maintenance instructions. Adjust equipment when the temperature is approximately 70 degrees F.

3.04 AUTOMATED GATE SYSTEM ACCEPTANCE & VALIDATION:

A. Acceptance Test:
   1. Test each system function.
   2. Supply all equipment necessary for system adjustment and testing.

B. Test and Explain Safety Features:
   1. Each system feature and device is a separate component of the gate system.
   2. Read and follow all instructions for each component.
   3. Ensure that all instructions for mechanical components, safety devices and the gate operator are available for everyone who will be using the gate system.
   4. The warning signs shipped with the gate operator must be installed in prominent position on both sides of the gate.

C. System Validation:
   1. The complete system shall be adjusted to assure it is performing properly.
   2. The system shall be operated for a sufficient period of time to determine that the system is in proper working order.
   3. Ensure the owner is clear with regard to the safety points concerning the basic operational guidelines of the safety features of the gate operator system. These safety points are listed in the operator manual and must be read prior to system use.

END OF SECTION